

## PNL Benchmarks: Unreflected Plutonium-Nitrate Solutions and MOX Lattices

Name	Spectrum	Handbook ID	Description
PNL-1	Thermal	PU-SOL-THERM-021, case 7	Unreflected 14-inch sphere of plutonium nitrate solution
PNL-3	Thermal	PU-SOL-THERM-011, case 18-1	Unreflected 18-inch sphere of plutonium nitrate solution
PNL-4	Thermal	PU-SOL-THERM-011, case 18-6	Unreflected 18-inch sphere of plutonium nitrate solution
PNL-5	Thermal	PU-SOL-THERM-011, case 16-5	Unreflected 16-inch sphere of plutonium nitrate solution
PNL-6	Thermal	PU-SOL-THERM-021, case 3	Unreflected 15.2-inch sphere of plutonium nitrate solution
PNL-8	Thermal	PU-SOL-THERM-021, case 2	Unreflected 15.2-inch sphere of plutonium nitrate solution
PST-9	Thermal	PU-SOL-THERM-009, case 3a	Unreflected 48-inch sphere of plutonium nitrate solution
PNL-30	Thermal	MIX-COMP-THERM-002, case 30	Lattice of 469 MOX pins (2 wt.% PuO <sub>2</sub> ) in water (1.7 PPM)
PNL-31	Thermal	MIX-COMP-THERM-002, case 31	Lattice of 761 MOX pins (2 wt.% PuO <sub>2</sub> ) in water (687.9 PPM)
PNL-32	Thermal	MIX-COMP-THERM-002, case 32	Lattice of 195 MOX pins (2 wt.% PuO <sub>2</sub> ) in water (0.9 PPM)
PNL-33	Thermal	MIX-COMP-THERM-002, case 33	Lattice of 761 MOX pins (2 wt.% PuO <sub>2</sub> ) in water (1090.4 PPM)
PNL-34	Thermal	MIX-COMP-THERM-002, case 34	Lattice of 161 MOX pins (2 wt.% PuO <sub>2</sub> ) in water (1.6 PPM)
PNL-35	Thermal	MIX-COMP-THERM-002, case 35	Lattice of 689 MOX pins (2 wt.% PuO <sub>2</sub> ) in water (767.2 PPM)

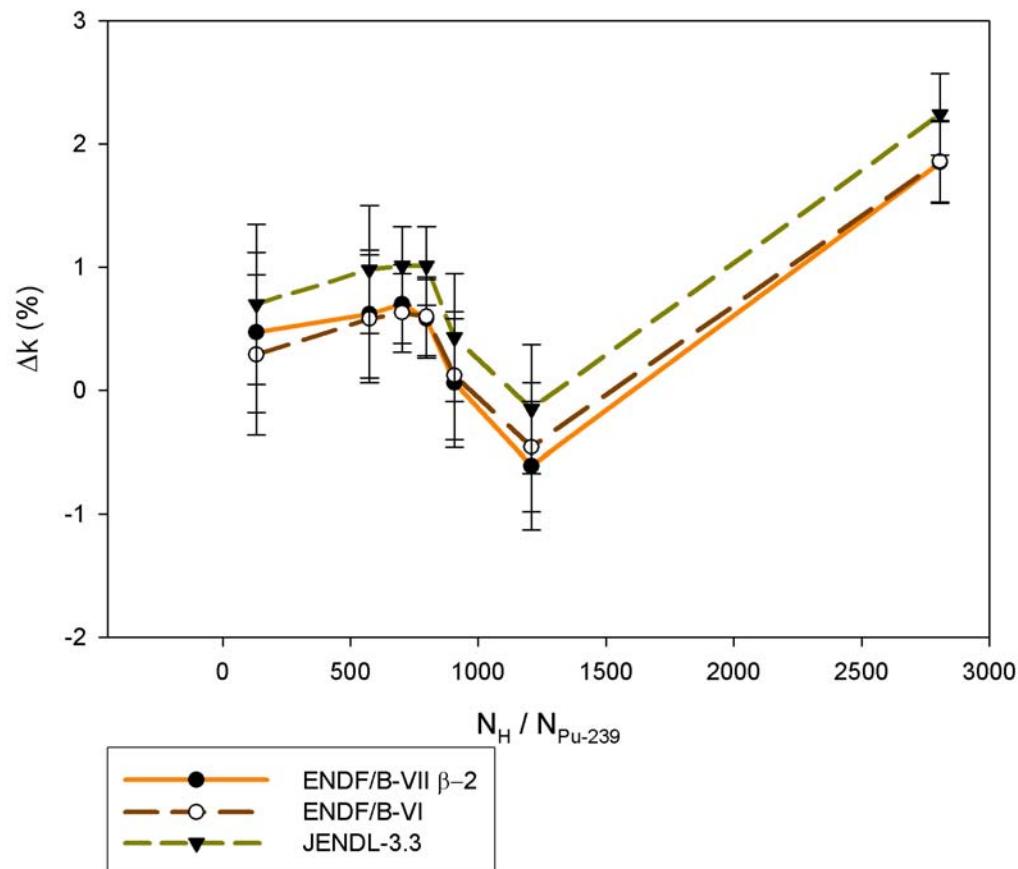
## Unreflected Spheres of Plutonium-Nitrate Solutions

Case	H / $^{239}\text{Pu}$ Atom Radio	Benchmark $k_{\text{eff}}$	Calculated $k_{\text{eff}}$		
			ENDF/B-VII β-2	ENDF/B-VI	JENDL-3.3
PNL-6	131.83	$1.0000 \pm 0.0065$	$1.0047 \pm 0.0005$	$1.0029 \pm 0.0005$	$1.0070 \pm 0.0004$
PNL-5	574.52	$1.0000 \pm 0.0052$	$1.0062 \pm 0.0004$	$1.0058 \pm 0.0004$	$1.0098 \pm 0.0004$
PNL-1	701.70	$1.0000 \pm 0.0032$	$1.0070 \pm 0.0004$	$1.0066 \pm 0.0004$	$1.0101 \pm 0.0004$
PNL-8	797.62	$1.0000 \pm 0.0032$	$1.0058 \pm 0.0004$	$1.0060 \pm 0.0004$	$1.0101 \pm 0.0004$
PNL-4	907.13	$1.0000 \pm 0.0052$	$1.0006 \pm 0.0004$	$1.0012 \pm 0.0004$	$1.0043 \pm 0.0004$
PNL-3	1207.8	$1.0000 \pm 0.0052$	$0.9939 \pm 0.0004$	$0.9954 \pm 0.0004$	$0.9985 \pm 0.0004$
PST-9	2806.8	$1.0003 \pm 0.0033$	$1.0188 \pm 0.0002$	$1.0190 \pm 0.0002$	$1.0226 \pm 0.0002$

$$\sigma < |\Delta k| \leq 2\sigma$$

$$|\Delta k| > 2\sigma$$

## Unreflected Spheres of Plutonium-Nitrate Solutions



## PNL MOX Lattices

Case	Pitch (cm)	Soluble Boron (PPM)	Benchmark $k_{\text{eff}}$	Calculated $k_{\text{eff}}$		
				ENDF/B-VII β-2	ENDF/B-VI	JENDL-3.3
PNL-30	1.77800	1.7	$1.0010 \pm 0.0059$	$1.0010 \pm 0.0003$	$0.9933 \pm 0.0003$	$0.9987 \pm 0.0003$
PNL-31	1.77800	687.9	$1.0009 \pm 0.0045$	$1.0025 \pm 0.0003$	$0.9960 \pm 0.0004$	$1.0008 \pm 0.0004$
PNL-32	2.20914	0.9	$1.0024 \pm 0.0029$	$1.0028 \pm 0.0003$	$0.9965 \pm 0.0004$	$1.0018 \pm 0.0003$
PNL-33	2.20914	1090.4	$1.0024 \pm 0.0021$	$1.0066 \pm 0.0003$	$1.0029 \pm 0.0003$	$1.0069 \pm 0.0003$
PNL-34	2.51447	1.6	$1.0038 \pm 0.0022$	$1.0043 \pm 0.0003$	$0.9989 \pm 0.0003$	$1.0033 \pm 0.0003$
PNL-35	2.51447	767.2	$1.0029 \pm 0.0024$	$1.0067 \pm 0.0003$	$1.0031 \pm 0.0003$	$1.0062 \pm 0.0004$

$\sigma < |\Delta k| \leq 2\sigma$

$|\Delta k| > 2\sigma$

## PNL MOX Lattices

